

The Global Amphibian Crisis

Why do we need amphibians?

We need amphibians. Humans have discovered antibiotic and anti-tumor properties, analgesics, anti-inflammatory compounds, and natural adhesives from amphibians. We have used them to learn anatomy and for medical research and tests. Changes seen in amphibians have often been heralded as an indicator of changes in ecosystems because of their semi-permeable skin, which makes them particularly sensitive to changes in their terrestrial and aquatic environments.

Where are the amphibians?

The Problem

Frogs and toads are disappearing, along with salamanders, newts, and the unusual caecilians. Older than the dinosaurs, recent studies show that almost one-third of all known amphibian species (and there are over 6,000 of them!) are faced with the possibility of extinction, while 120 species are thought to have gone extinct in recent decades. No other class of organisms – birds, mammals, or plants – has faced such a high risk of widespread extinction.

The Culprits

- **Habitat loss and fragmentation** - The leading cause of amphibian declines throughout the world is habitat loss. On the plus side, amphibian populations decline slowly in response to habitat change, giving people the opportunity to implement measures that would counteract this threat, such as creating protected areas.
- **Chemical pollutants** - Chemical pollutants from agriculture and mining, as well as from human consumption of pharmaceuticals, can have a direct impact on these sensitive and semi-permeable creatures. Chemical pollution has been associated with amphibian malformations, implicated in changing the gender balance of populations, and changing water quality so that the water is inhospitable to amphibian life.
- **Invasive species** - Aquatic habitats are often manipulated to improve their appeal and usefulness to humans. Sport fish that are added to streams for recreational purposes feed directly on the eggs and tadpoles of native amphibians. Introduced predators and invasive species wreak havoc on ecosystems, and do not always come from distant countries. For example, the massive American bullfrog eats everything in its path, including native frogs in all life stages. Although bullfrogs are native to the eastern U.S., they have become a major problem in the West.
- **Disease** - A mysterious fungus, *Batrachochytrium dendrobatidis* (“Bd”), is the culprit behind both current and historic, dramatic and rapid amphibian population declines throughout the world, including “pristine” mountain areas. Described in both wild and captive populations in the late 1990’s, the Bd fungus thickens keratinized areas of amphibians, such as the mouthparts of tadpoles and the keratin in the skin of adults, preventing the healthy transfer of oxygen and other gases across amphibians’ skin. While more species are affected by habitat loss than Bd, the disease causes sudden and dramatic population declines that can lead to rapid extinction. Unfortunately, at this time, the Bd fungus cannot be controlled or stopped in the wild, although affected individuals can be cured of the infection when brought in from the wild.

Zoos and *Bd* - Identifying the problem

Zoos have played a large role in identifying and researching *Bd*. In 1991, a pathologist named Dr. Donald K. Nichols working with zoos throughout the country received the bodies of three preserved California Arroyo toads (*Bufo microscaphus*). The toads came from a captive colony whose population had declined 60% in just a few months; an unknown skin disease was responsible for their demise. After joining the staff at the National Zoo in Washington, DC, Dr. Nichols and colleagues reviewed amphibian pathology files from the collection and saw evidence of the same disease. Several years went by and clues surfaced indicating that a chytrid fungus might be involved. However, no chytrid had ever been recognized as pathogens in vertebrates at that time. In 1996, a new outbreak of this disease again affected the National Zoo's collection, and the Zoo was able to send fresh skin samples to a fungus expert. She identified the fungus as not just a new chytrid species, but also as a previously unknown genus. The organism was eventually named *Batrachochytrium dendrobatidis* (*Bd*), or "frog chytrid of dendrobatids."

While characterizing this organism, word traveled that a similar disease was reportedly causing amphibian declines in Central America and Australia. Isolates from multiple species in various areas all have turned out to be this strand of *Bd*. The impact on amphibians of this emerging and newly described fungus is still just beginning to be understood.

Taking action – Case Study

In 2004, a mass amphibian die-off was tied directly to the arrival of the *Bd* fungus in El Copé, Panama. Dr. Karen Lips at Southern Illinois University and colleagues tracked the movement of the fungus through Costa Rica and into Panama, allowing people to predict which mountain valley would next be affected, and when. In response to this information, Zoo Atlanta and the Atlanta Botanical Garden, in collaboration with the Panamanian government, initiated a huge rescue effort. With no safe place to go in Panama, assurance populations of 35 species were brought to US facilities in 2005. The development of a safe place for amphibian species in Panama was the next logical step and the Houston Zoo worked with El Nispero Zoo in Panama and numerous other AZA-accredited zoos and aquariums to build and maintain the El Valle Amphibian Conservation Center. However, *Bd* arrived to the Valley in January/February 2006, before the Center was completed, and a hotel was used as an emergency holding area. Amphibian declines in the wild started to become apparent. The Center is now mostly completed and houses 17 species, with a goal of holding up to 40 species in the future. Sadly, the fatalities have not waited: the iconic Panamanian golden frog already may have already become extinct in the wild.

The Association of Zoos and Aquariums (AZA) will highlight 2008 as the Year of the Frog to mark a major conservation effort to address the amphibian extinction crisis. The Year of the Frog is meant to engage the public in amphibian conservation and to raise funds for AZA amphibian conservation efforts into the future. AZA facilities will lay the groundwork for expanding existing and initiating new amphibian conservation efforts.

To learn more and to pledge to be a *Friend to Frogs*, visit www.aza.org/yearofthefrog.